Feb. 2, 1971 P. B. JUHNKE 3,559,221

MULTILAYER HULL FOR A SMALL BOAT

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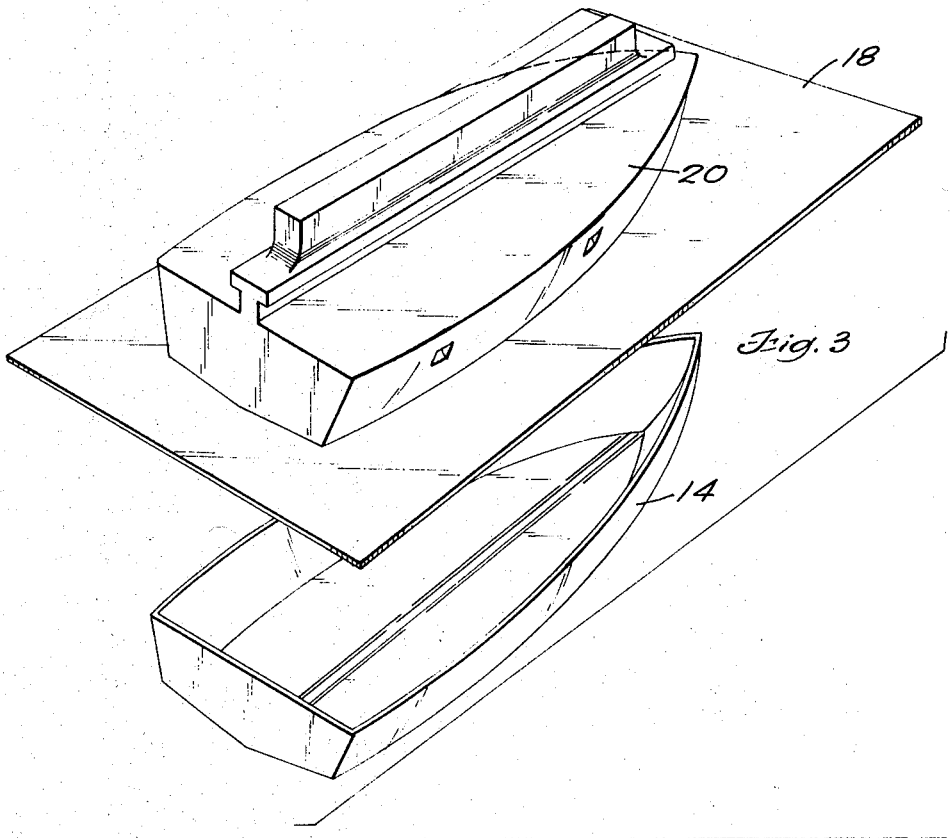

Fig. 3

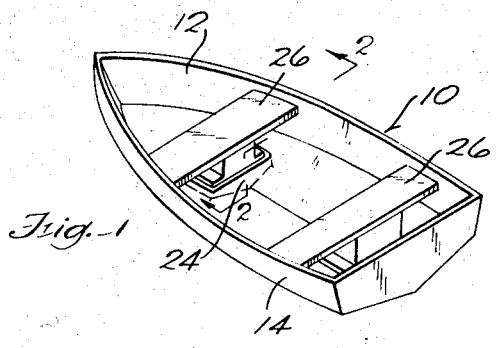

Fig. 1

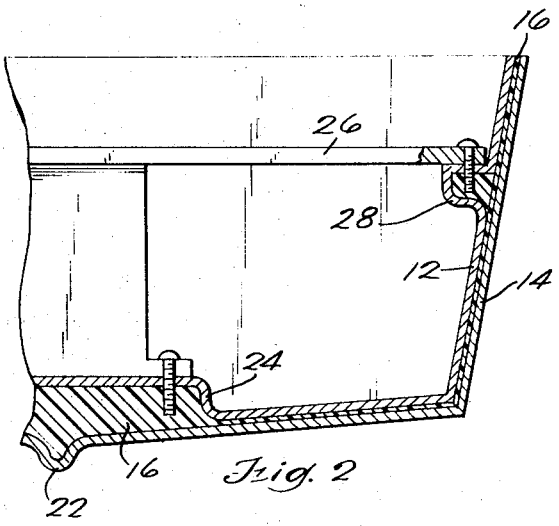

Fig. 2

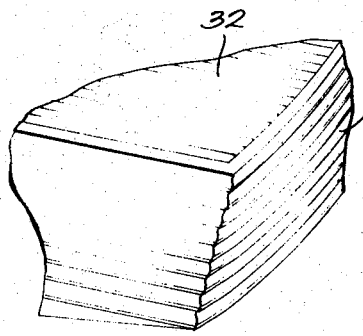

Fig. 4

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MULTILAYER HULL FOR A SMALL BOAT

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U.S. Cl. 9—6 1 Claim

ABSTRACT OF THE DISCLOSURE

This disclosure comprises a panel, shell, hull of a boat, or other formed shape which consists of outer and inner thin sheets of aluminum bonded together and made rigid by an internal layer of epoxy or other resinous cement.

BACKGROUND OF THE INVENTION

(1) Field of invention

This invention relates in particular to small lightweight boats which can be inexpensively constructed from thin sheets of aluminum bonded together and rigidized by an internal layer of resinous cement. However such layerized sheets may be used in the construction of any forms where lightweight is essential.

(2) Description of the prior art

Heretofore boat hulls have been constructed of layerized material such as steel or iron sheets, see U.S. Pats. 32,403; 291,909 (including an intermediate layer of paper); 659,948; and 1,289,760 (intermediate layer of rubber and cork). They have also been made of outer and inner skins of fiber glass with an intermediate layer in certain portions of foamed plastic, see U.S. Pat. 3,126,856.

SUMMARY OF THE INVENTION

The essence of this invention is the use of thin outer and inner layers or skins of aluminum bonded by a layer of resinous cement. The sheets are thin enough to be easily formed in a press and are less than one-half the ordinary thickness used on aluminum hulls of small boats or canoes. A thickness as little as 0.010 inch have been found practical. However a thickness of 0.020 inch provides sufficient flexibility for easy forming and is also economical. The inner layer of sprayed-on self-curing epoxy is not used for effecting flotation but solely to provide bonding strength and rigidity. Hence there is a saving in weight and cost of aluminum. The aluminum can be more easily formed. The hull thus formed has the advantageous resistance to tearing (known as tearing strength) of a solid sheet aluminum hull but in comparison is lighter in weight and less expensive to manufacture.

In the event greater rigidity and/or stability is required ribs can be introduced with the forming of the aluminum skins. The internal voids created by such ribs are filled with the rigid adhesive. Also enlarged recesses may be formed and filled with enough volume of the cement to provide holding power for screws used to attach seat supports and the like.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing:

FIG. 1 is a perspective view of a hull of a boat formed with thin sheets of aluminum bonded together and made rigid by an internal layer of epoxy in accordance with the present invention;

FIG. 2 is an enlarged fragmentary section view taken on the meandering section line 2—2 of FIG. 1;

FIG. 3 is an exploded view of a male die or form, a thin sheet of aluminum before forming and the outer shell of the hull of a boat which has been previously formed from a similar sheet and before the application of a layer of epoxy to the inner surface of such outer shell; and

FIG. 4 is a portion of a boat structure embodiment in which corrugated sheets are used for the inner and outer shells.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing by reference numerals the hull of a small lightweight boat **10** (see FIG. 1) of standard design is formed by an inner metal skin or shell **12** and an outer metal skin or shell **14** bonded together and made rigid by an internal layer of epoxy **16**. Preferably these skins **12** and **14** are formed from a sheet of aluminum **18** (see FIG. 3) approximately 0.010 inch thick. The outer skin **14** is first formed from a sheet **18** by use of male die, not shown, but similar to the die **20** of FIG. 3. Then a layer of epoxy is applied to the inner surface of the shell **14** by painting, spraying or other standard method. The epoxy is of the self-curing type. The thickness of the layer may vary considerably depending upon the type of hull being formed. Since the epoxy is providing strength and rigidity as well as the bonding element it has been found that a thickness of approximately 0.040 inch is satisfactory.

After the layer of epoxy is applied to the shell **14**, a die **20** presses the sheet **18** into the outer shell **14** thus forming the completed multilayer hull. As the epoxy cures at room temperature it will make a bond between the inner and outer aluminum shells. Since the epoxy layer when cured has inherent strength and rigidity it will provide the hull with a higher degree of rigidity than a single layer of aluminum of comparable thickness. Thus a hull is provided at much lower cost than that of a single layer aluminum hull. Nevertheless this multilayer hull will have the equivalent tear resistance strength of a non-layerized aluminum hull and even greater rigidity.

Another advantage lies in the ease with which the inner and outer shells of the very thin aluminum can be formed. This speeds up production and lessens the cost of presses and dies.

If greater rigidity is desired several alternative structures can be incorporated in the hull. The outer shell may be formed with a downwardly extending keel **22** running substantially the length of the hull. Also at spaced positions, the inner shell may be formed with upwardly projecting pedestals **24**. These pedestals provide supports for the central portions of athwart seats **26** as well as stiffening the hull. The inner shell may further be formed with inwardly projecting shelves **28** which provide support for the ends of the athwart seats **26**. The voids created by such keel, pedestals and shelves are filled with the epoxy which materially adds to the rigidity of the hull.

If necessary screws and occasional rivets may be used to secure the athwart seats and keep seams closed. This could also be accomplished by welding contacting edges of the aluminum shells.

In the embodiment shown in FIG. 4 the sheets are corrugated and then formed. The corrugations **30** in the outer shell running generally keelwise and the corrugations **32** in the inner shell running generally athwartship. When the spaces are filled with epoxy the unit will be extra rigid and strong.

I claim:

1. A multilayer hull for a small lightweight boat comprising:

an outer hull skin formed from a sheet of aluminum

and provided with a downwardly formed longitudinally extending groove forming a keel;

an inner hull skin formed from a sheet of aluminum and designed to nest within the outer hull skin, said inner hull having upwardly projecting pedestals;

said sheets of aluminum having a thickness of from 0.010" to about 0.020"; and

a layer of resinous self-curing epoxy between said skins, said layer being approximately 0.040" thick except in the voids created by said groove and said pedestals so that said layer, in addition to bonding said skins, also has inherent strength and rigidity to provide the hull formed from thin sheets of aluminum with a degree of rigidity greater than a hull formed from a single layer of aluminum the thickness of which is at least as great as the total thickness of said multilayer hull.

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